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tubes which present much analogy to the Malpighian canals of the Araneidæ described by Plateau.

Crustaceans.—E. A. Birge (Stud. from the Biol. Lab. J. Hopk. Univ., 1883), describes and figures various stages in the development of *Panopæus sayi.* The zoea moults a large number of times. In the change to the megalops stage all trace of the long spines is lost. In this it differs from Cancer, in which the megalops retains the dorsal and frontal spines. The last megalops stage is reached after at least four moultings.

Birds.—The osteology of the kingfisher (*Ceryle alcyon*) is described and well figured by Dr. Shufeldt in the *Journal of Anatomy and Physiology*, XVIII, 279. After touching upon the general characteristics of kingfishers, their distribution, mode of life, and the views of the leading authorities upon their taxonomy, he then examines the skeletons. The account is rendered a comparative one, as Alcedo is compared with Ceryle, and sometimes with Geococcyx and Coccyzus.

Mammals.—M. A. Milne-Edwards announces the discovery of a new species of Hydropotes, called by M. Hende *H. argyropus.* It is a native of Corea, and differs from *H. inermis* in the lighter color of its hair, and in some cranial characters.

PHYSIOLOGY.[1]

BIOLOGICAL ACTION OF THE SALTS CONTAINED IN SEA WATER ON THE EXISTENCE OF MARINE ANIMALS.—An essay on this subject by H. A. Coutance, has been translated and published in the last report of the U. S. Commissioner of Fish and Fisheries. Marine animals are organisms of excessive sensibility, and in their distribution are dependent on the composition of the salt water, the nature and quantity of the gases dissolved, and the temperature, force and operation of the currents. M. Coutance experimented on the common mussel, the *Venus decussata*, the common periwinkle, and the whelk, *Buccinum undatum.*

By reason of their different organization these mollusks gave very different results. The bivalves which could shut themselves up between their valves, as a general rule, showed greater resistance than the univalves. Of these the periwinkle, whose operculum can close entirely, prudently retired into the remotest coils of the spiral, and were thus better protected than the buccins, whose opening does not shut tightly, and into which the water can easily enter by the canal at the mouth of the shell.

Salts of potash seem much less favorable than the salts of magnesia, and especially than salts of soda. Life ceased first in the ioduret, the bromide, the chloride, and the sulphate of potassium, and in solution No. 10, the prevailing element of which is chloride of potassium.

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[1] This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.

The salts of soda and magnesia still maintained life when the animals had succumbed in the salts of potash. Solution No. 9, for instance, the principal element of which is chloride of magnesium, preserved its inhabitants alive much longer, and the same applies to the sulphate of magnesia alone, and in solution No. 11.

The resistance of the palourdes in the Vichy water shows the favorable action of salts of soda on the preservation of life in marine animals; for forty days the palourdes lived in this mineral water!

It was in the sulphate of magnesia and the sulphate of soda that life was sustained longest, the latter excelling the former. On the 12th of March I tasted some of the *Venus decussata*, which had been kept in sulphate of soda for sixty days, and found their flavor excellent and without any trace of a bitter flavor. This observation might prove useful in alimentary economy, as the palourde is a highly prized shellfish, and sulphate of soda can be bought cheap.

It is a fact worthy of remark that it was only in the solutions of sulphate of soda and sulphate of magnesia that green algæ commenced to make their appearance at the end of sixty days. The conditions favorable to marine animal life are then apt to develop vegetable life. There is nothing surprising in this parallelism, but it receives from the present circumstance a curious confirmation. One singularity appears: the solution of chloride of sodium (impure marine salt) did not sustain life as long as the solutions of salt of magnesia and sulphate of soda, and yet salt is an essential element of the sea water. This proves that the mollusks are adapted, not to pure salt, but to that peculiar mixture which constitutes the natural sea water; and that the secondary elements, as regards their quantity, play an important part. This gives us reason to suppose that the accidental modifications of the water of the sea during the different geological periods must have had a great deal to do with the extinction of various species.

The Venus remained closed in most of the solutions, the nature of which they doubtless learned to know by opening their valves a very little. Meanwhile, they occasionally put their siphons outside the shell, for instance, in the sulphate of magnesia and in the sulphate of soda. In the solution of chloride of sodium and in the sea water they had their siphons out nearly all the time.

The palourdes can live for more than a month in the air in a cool place. For about twenty days they remain shut; later they open their valves and protrude their siphons. At the least touch they draw them in and close their valves. Then comes the moment when the striped muscles which bring the valves together have no longer the strength to do this, although the smooth muscles which retain them will still do so, when one closes the valves. In all the solutions in which these mollusks have lived these same phenomena could be observed.

The weakening of the muscles showed itself first in the striped part of the adductors, which draw the valves together, and later in the smooth part of the same muscles, which held the valves artificially closed for a constantly decreasing period.

The *Venus reticulata*, or clovisses, showed the same phenomena; the order of extinction of vitality in the different solutions was the same; but these mollusks did not live as long as the preceding ones. They succumbed a month after they had been placed in the solutions, first in the salts of potash, then in the salts of magnesia, and finally in the salts of soda.

The periwinkles resisted longer than the bivalves, and showed less repugnance to the sulphate of soda, in which they lived forty days.

The great buccin succumbs much quicker, as it cannot close its shell hermetically like the periwinkles. At the end of twenty-four days it died in most of the solutions employed, especially in the salts of potash. Its life was prolonged forty-eight hours in solution No. 12, in the sulphate of magnesia, and in the sulphate of soda, but soon came to an end.

During all the time these experiments were going on, from January 10 to March 15, the palourdes and the periwinkles lived in the sea water of the laboratory, the *Venus reticulata* and the mussels not quite so long, and the buccins only a few days.

It is a very important fact, to which we direct special attention, that the salts which constitute the sea water and the different solutions which we employed gave to the water the faculty of dissolving variable quantities of atmospheric air. We proved by direct experiments that the solutions of salts of soda retain more air when agitated by it than the solutions of salts of potash. This would, therefore, prove that the poisonous character of the salts mentioned in our experiments is caused in part by the circumstance that they do not let their solutions become sufficiently aërated; their action produced asphyxia. This explains why the sulphate of potash and the sulphate of soda, neutral salts to which the mollusks are by no means adapted, act so differently upon them, the salts of potash killing them quickly and the salts of soda preserving them for some time.

From these experiments the following conclusions have been reached:

1. The saline elements of the sea water act very differently on mollusks.

2. Every modification in the composition of the sea water finally becomes fatal to the life of these animals.

3. Their greater or less resistance depends on their organization. Bivalves resist better than spiral shells, and in these two groups the results vary according to the different species.

4. Salts of potash are less favorable to the life of mollusks than

salts of magnesia, and salts of magnesia are less favorable than salts of soda.

5. Outside of the salts dissolved in sea water the sulphate of soda seems to possess a well-established preserving neutrality.

6. The death of bivalves is caused by a general weakening of the muscles.

7. As the muscles can no longer draw together or open the valves, the animal is exposed to the unfavorable or poisonous action of the element.

A NEW EXPLANATION OF THE PROCESS OF INFLAMMATION.—In the last number of the *Quarterly Journal of Microscopical Science* there is a translation of Dr. Elias Metschnikoff's paper "On the Mesodermic Phagocytes of certain Vertebrates," originally published in the *Biologischer Centralblatt.* Metschnikoff has shown elsewhere that certain amœboid cells in the tissues of the invertebrates have the power of ingesting and absorbing food particles. On experimenting with vertebrates, he found that the connective tissue cells had the same power, and that, in a batrachian larva about to metamorphose, the absorption of the tail was brought about by these cells, which he terms "phagocytes." At the beginning of the metamorphosis these amœboid connective-tissue cells collect round the muscles of the tail, and gradually devour their fibers. The fragments of muscle retain their structure for some time after ingestion, so that that process can be readily seen to take place, but gradually lose their striation and break up into rounded strongly refracting globules. In order to ascertain whether these "phagocytes" would absorb, and so eliminate from the system injurious substances, Metschnikoff injected putrescent blood, so as to induce septicæmia. In a short time the white blood corpuscles (which are also included in the term "phagocytes"), were seen to contain both still and motile bacteria, and these organisms were especially abundant in the "hæmophagocytes" or white blood corpuscles of the spleen. This fact, taken together with the probability that the spleen has no very important physiological function, since animals live without much apparent discomfort after its complete excision, seems to indicate a prophylactic function for the spleen, it being merely a protection against septic bodies such as bacteria, the removal of which from the body is its function.

To apply these facts to the process of inflammation. When inflammation was induced in the tail of a newt, the first phenomenon was the collection of connective-tissue "phagocytes" round the injured cells, followed by the passage of "hæmophagocytes" or white blood corpuscles through the walls of neighboring capillaries, both collecting apparently for the purpose of devouring and so removing the ruptured, dead and dying cells.

In fact the essence of the whole inflammatory process may be said to be a conflict between the "phagocytes" and the septic material, whether the latter be a dead or dying cell, bacteria or other foreign body. In the invertebrates, where connective-tissue cells are abundant, the vascular system does not participate in the process, only doing so among vertebrates, where the extra-vascular "phagocytes" are not sufficiently numerous to combat the injurious structures, a call for assistance being then given to the "hæmophagocytes." The first effect of irritation is on the connective-tissue "phagocytes," the changes produced in them subsequently influencing the capillary walls, and allowing the transit of the white corpuscles.

The theory has much to recommend it, being founded on logical, *á priori* grounds, and affording simple explanations for many obscure points in connection with inflammation. For instance, it affords a simple explanation for the presence of the large numbers of connective-tissue and white blood corpuscles that have been observed in induced keratitis, and also it explains how in certain epidemic fevers—famine-fever for instance—numerous sprilla, etc., can exist in the blood of as yet unaffected individuals, without causing any symptoms of the epidemic. At the same time the theory is quite compatible with all definitely ascertained pathological facts, a circumstance which alone would give it considerable weight.—*Professor McMurrich, in Canada Lancet, May, 1884.*

PSYCHOLOGY.

SINGULAR FRIENDSHIP BETWEEN TWO BIRDS.—During the summer of 1880, I purchased from a Chicago bird dealer a number of birds for my aviary, and in making my selections, the dealer, after considerable parley, permitted me to separate a male "African cutthroat finch" from his mate, which, with the others, some thirty birds, were shipped here. Of the number was a male white Java sparrow, whose principal occupation seemed to be the pecking and pulling out of feathers of the cutthroat finch. The separation of these two birds was the only way to have peace in the cage, but upon their being brought together the old feud was resumed. While in the cage with the rest of the birds there was but one that took any part in the conflict or attempted to shield the cutthroat, and this was an indigo finch (*P. cyanea*).

The moment that the two were placed in the one cage the Java would at once fly upon the frightened finch and nearly kill him, and he would rush from one side of the cage to the other, eagerly trying to find some place of retreat; perhaps behind some other bird, but only for the moment, for the vicious Java would drive him from his shelter to again chase him to his heart's content.

In the meantime I ordered more birds, a mate for the Java and a number of finches from Africa and other countries, and upon their arrival the experiment of watching their reception by the